Notebook, N-09-04-20.1

This notebook covers the period April 1909-April 1910. All entries are by Edison. The book is the first of two books that contain notes regarding attempts to find a hard, non-celluloid material for use in phonograph cylinders. Included are entries pertaining to the use of shellac and various other compounds to produce a substance that could be molded but would also be durable enough to sustain more threads per inch on the cylinder. There are several notes indicating Edison's application of the experimental results to disc records. Many of the entries in this book are rough notes that were subsequently transcribed into N-09-04-20.2. The front cover is labeled "Solvents 1909." The pages are unnumbered. Approximately 30 pages have been used.

April ~~[illegible]~~ 20th 1909

Recs at Exports on hand tough materials & solvents, matted those that crystalize out with small quantity shellac, Kauri Etc + those which do not crystalize out + we get hardness by the Shellac Kauri Etc Itself.

Those found so far that crystalize out & make the need alloy — is
Morphtolane — ok fine but ob poor turnice small
Monnitronaphtolene fine cheap + ok —
Shellac dont combine to rubbery stuff & Kauri ok —
Monobromocamphor — Very good one of the best at Crystal end —

Resorcin so good for solvent non cry. end lump good turbine considerable
Can go to limit until nearly all shellac chill quick — its harder than necessary its brittle + hard like fulton lac soften very little by heat hard — The alloy dont mix with Olsona acid at all

Stearic acid good at both ends
but better as a solvent than a
Copalchi must keep temperature
low or it Condenses the Sac
at high end showed use little
Acetanilide to make it more
limpid for pouring – very little
is required –

Phenacetin & Kauri crystal out
sep very hard – brittle, dense free
fresh Easy fine surface
Can vary proportions condensed

Kauri & Acetanilide Crystal out hard
very little Kauri necessary to the
Copalchi & Acetanilide that
gives the hardness – brittle – Cheap
mix –

Monoethylphenol acts about same as
Nitronaphthalene but not so cheap
or Easy to make – Crystal –

Too soft highend – no

No

If the free cresols are not got rid of in the Nitro compound the Lot is ok or condemned to nuisance compound —

Triacetyl-hydroquinone – Crystal end Lot dissolves very easy works fairly well – afraid acetic that comes off attack mouth – This is not very Cheap – great royalty power – don't guarantee Lot

Monoacetronaphtalene with Lot so much lost can be put in that it will take 24 hours before it goes from soft to the hard state by the Nitro crystal out –

Phenylacetamide not good – dont crystal out well – system bad – No for Lot Too soft the highend

High end –

High end only bottle like button hac – just no hand

Carbon tr. Alkoxide Neg.
too sullenly —

Benzophenone – dont crystal out at once maybe tomorrow
Can carry hac to high percent –
dont condense — can't tell till
tomorrow – OK high end —
Its good solvent, dont smoke
much — probably good at
both ends tomorrow too bottle of crystal
but hard – at alkoxide end good tough hard – flexible at ends
this will work in Bad one have to high end ~~but it~~
Later the length must be long enough to be easily made
more shell —

Benzamilide — not good on
quick crystal end – fair on high
end I guess – tell tomorrow
Solvent power only fair get
thick + opaque when
moderately high up —
very bottle higher just like button
dry.

Cryst at hard End
fair –
Nosmell –

only good for
Cryslog End good –

Phenanthrene

Good Solvent cryst out with considerable
Sol, possibly more nice Cryst
out in crumbly large bulkes is
as thick as cooked cork practically
it foams on rising heat too much –
at Cryslg End about same as Naphthalene
No smell – High End hard but somewhat
brittle, may be ok

Bichloronaphthalene – No cryst – hy hard
too brittle – NG

Fluorene (Hydrocarbon) –

Works ok Cryst end yellow as good as
any – only good for
Cryslog End & hard dense good

High end good —
Dark need much
Trichloro —

Trichlorophenol —

Good solvent for shellac, dont
Crystalize out on flow cut many do so
in time — 24hr

This is fine for high end very hard & tough
24hr High end gelatinized well but dissolve strong - also hard on brittle
but — 1/3 chips off dish & mostly gelatinized any by heat blow
off too, safe to work with —

Tetrachlorophenol } mixed
& Trichlorophenol }

This is a terrible Crystalizer —
almost impossible make
high end it gets so thick —
dont gas but little it quickly
down when get cooler glassy
probably on boiling off of the
Chloro — Crust & high.
But only good for very smooth but
very hard & brittle chips act on
but to very hard — 24 hour flow
big button well not come off 1/3 chipped
off - brittle hard like button bac —
Crystal only come off of ~~the~~ yellow dense
very hard brittle (18) chips out on cutting
not wood cut like —

Cryst OK A1
Echanuly (unpl) -

Pyrocatechin —

No Cryst — solvent but it gelts thick very soon, only gauge when cold. Not good developer when cooler but too viscous & thick after 24 hours very hard (tough-leather) cut, cant get it free for stock and it is considerably big heat hard

Monobromo camphor Very fine solvent Crystalizes yellow Gutter Extremely hard inert wood chip - Has when bottle shellac & solution as Graphic as water & low temp — Has no tan actional Solvent - It also goes to high end very quickly with more shellac for Crystalizer End This is OK A1 — Big Efflorescence & gives bad surface on cut Jus inted Kill it for phono -

Methacetin - not good solvent Dont show Crystals - goes to high End the big log soft high up tough but soft - (dead)

good - (low temp)
Crystals - Cheap
good Solvent
needs an steam plate

Dinitrobenzol Meta
fine crystals very hard
not as hard as Mononitronaphthalene but passable
Can be by proper proportions - MP low &
good solvent, did it on hot plate -
disadvantage altho all very low temp
Thinks its good for printing at 150 Fahr
if you go too high it could crystal out
owing to very low temp & no smoke
this should be good on Crystals and
steam heat it would be also for
individual Spinners - & cheap
No smell - but unpleasantly the hard
Crystals of Dinitro help to make it
Nitroder than Naphthalene or Alcohol
its fine grain - Comes free of
dust all -
When you use maximum dye that could
still Crystalize its hard & tough
wood cut - comes off dull fine -

Only good to mix
with other things

Dimiro Solubl - Papa —
Not good solvent only mixes
Don't think it will answer

Battle marked Nitrō Solubl, dep crystl
Bad solvent, no margin on crystg out
high end sent away till morning
Not desirable —

Quinoline alkaloid —
Actual solvent, don't crystl,
Evidently heard + 6 drs the on pouring
leaves deposit of tarry too 6 drs the
~~so~~ if get too much Lac too
thick, It might be used with
other things to help dissolve

good high end
Cheap
fine solvent.

DMH 75¢ lb

Benzonaphtole

This is a peach solvent - can get a small margin Cutpoint end. Tough not very hard but may be better + all very limpid solution -
You can then proceed almost until its all shellac + still practically limpid Enough = 75 ¢ lb -
it would be cheap on high end of good as very little used -
No smoke - Low temperature
Very Tough + hard on high end -
Break for Petit - only slightly softens by heat hand. -
High end is practically Dhellac improved by being Tough -
horny cut -
24 hours - good - dont soften by heat hand
1/3 come off dish limpid solution - bad dish however -

Quinine

Dissolves shellac perfect - unlimited, its very thick at all dilutions - low temp, comes off plate good - probably can use 1/5 by wt -
Benzton very brittle but kind - comes off plate ok -

Bromalin - no dont melt decomp -

Methylacetanilide "Exalgin"
good solvent dont get viscous or thick except at high end but not too viscous to work - poor at great end no margin - some smoke at high end - might say considerable = higher flexible after 2 hours drying, should have more shellac. Comes off plate ok -

Hydrochinon — Melts rather high
insolubleable: dissolves Lac OK
ng for Crystal 2nd —
Smell say about butter tree
Later — not very delicate
Smokes some
Soften heat hands — sam/stick to dish
Whole Gallon / don't crack off —

Nitroso beta Naphthol ng
decomposes —

Dimethylamidoazobenzene Butter yellow —
dissolves shellac fair — Viscous — no crystal
poly ng — don't smelle —

Hexachlorobenzol.
MP so high that doing anything with it
it might embrace to MP with other
things to reduce MP - or to
change hardness.

Benzidine No forget - high and
Graphite mg - ... dont combine GG plate
at all.

Nitromononaphthalene Made by Dr
9 = Mg dont work well either Eu
to impure - if specially had it power on Flex

Carbazole Mg too high MP
Sublimes dry fully

Anthracinoy — Ent

very high MP — sublime terrible

Even in dish —

Cant do anything with it —

Might do to mix —

Rosorcin — good adhesive

No coyet — but the high end

but little coy down low end + very

hard. Enough — its really thick

very little smoke — bubbles

on heating — must be stirred

Hard + very tough in small cuts chips. on heavy

cuts — stick to knife / 2 broke away by cutting the

good if hard + tough (end) and no coyet (end)

dont flavourably coy — low — and smoke —

Hydronaphtol — good adhesive

high end no coy — very little

smoke, melts fairly easy Viscous

must be well stirred

after 1 hour very hard — next to highest very

tough + hard — highest extremely hard + fine

Cut easy — dont adhere accurately — by by hand

Sports ends 1/4 chipped off

Low OCC Ambulex & Carbon Bisulph
high end only VEry heavy & bottle —
sticky to stick. Can't get a proof off

QWA Red glassy fusible Formal phenol
Condensation should be an unlimited
amount in Resorcin to liquid when?
should say 85% form The Condensation
product If a solvent is wanted
This is it off — see how it is in
morning

Lupus telfrachlor naphthalin
low end works splendid.
think the gray to be handled
yet + happy as QWA wants
Making some pure now

The mononitronap dont work like it
did in Tha — I made it by heating
glacial acetic & dissolving
Naph & adds in it +
putting in ordinary HNO_3
Then precipitated by water —
Crystl from EtOH. it worked
fine on low end — It may be
that the shellac I had was
def than what I am using
here —
The Mononitronap here made by
Dr. T. $HNO_3 + H_2SO_3$ — then
washed water soln &
pressed in press — I think
dissolved it in glacial A
+ crystal it out wash with
H_2O + then crystl from EtOH.
There is no low end with flake Naph
I am using — there is with
Kale & Ellis Fac 14C but poor
35C fac dont do any better.
on low end hence, the mononitronap
made by Acetic process must
be different from Reg way
in ~~[illegible]~~ HNO_3 or $HNO_3 + H_2SO_4$.

Chloral Hydrate & Lac ng
" Sleeve & Lac ng

Sleeve & Mangan + Sleeve acid + Lac
ng -

Sleeve acid + dilly Cephrachin
+ shellac ng

Lac + Phenanthrene good for
Shellac ng for yellow - Sufficiently Lith
by he + hand - Rough feeling + hard.

Lac + Pinakon - too thick mix
bubbly ng for yellow, as shellac
Edinburgh flexible bottom
Eosin + Pico lamp frozen

Salicylic Ha + Strych ng
don't mix well -

Naphthalene Chloride don't well
ng - also with Sleeve ng

Piperin – good solvent
bulbs flexible by heat & [illegible]
brittle cold stills [illegible]
brittle when flexible by cutting [illegible]
acetone clear & colorless high
shellac contents & bubbly also
more [illegible] slix to dissolved.

Cyanamide acid good solvent
~~[illegible]~~ poor follows higher
~~[illegible]~~ flexible –

Acid [illegible] curious
very sticky & viscous very
even with [illegible] shellac
bubbles but should make
a flexible varnish [illegible]

Copaiba acid & Lac
Very brittle — No

Benzoate Magnesium No

Rosin acid, high
Melting point — it goes
to liquid a fluid solvent
cooled to a hard. it would
Great Shellac for hardness
+ polish —

3rd	5th	6th
311	316	321

~~4th~~ 3.0 ~~5~~ —
~~6th~~ ~~7th~~
326 · 331

OK — 8th was little
Yellow —

~~Eg~~ 15 Stearic + 22 Shellac
Kept at very low temp in forming
mass having gone higher than is
just necessary to keep in form [illegible]
[illegible] for 3½ hours

and I am sure if proper appliances
were put to stamp regulation
1 to 2 hours if perfectly
practicable —

Yellows End

100 Shellac
60 Stearic. Melted stearic +
moment all melted reduced flame
very low + added shellac in solution
stirring after each addition until
flame to have heat to compensate
for Chill given by added shellac
should not exceed 240 Fahr
at 200 Stearic acid separates out
its nothing but a mechanical
Emulsion + must be stirred well
to get a fine emulsion — if you
go much higher than 240°
it will combine or that part
which is combined decomposes
& soften the yellow —

1st Button pound 1st 2 3rd 4th
436 — 441 446 451
5 6th 7 8th
456 461 506 511 518

525 532 550

for 40 minutes the Buttons are very light yellow & the right quality & OK — after that for 30 mins they get reddish & are not so tough because the long heat has caused Combination of the shellac with steam as the balloon if the dish was too hot & dider too cool — to get 1 hour or probably more Kettle showed 6 & boiled all over

" & not on the bottom
only. =
All of the bottom
even hours after making
got slightly more yellow.
It very much harder &
tougher —
There is no doubt but
that at around 240
its only an Emulsion
in Electric acid —
This principle of Emulsions
is of wide application
in the phono record
biz =

Chemicals to be made or bought

Tetrachloronaphtalene	modification a	MP 160	
Trichloronaphtalene			
Chloronaphtalic acid		MP 200	
Tribromoaniline		MP 117	
Dichloroanisic acid	MP 196		
Dibromoanisic "	" 173	B.P.	
Dibromoanthracene	" 221		
Tribromoanthracene	" 169		
Tetrabromoanthracene	" 254		
Dichloroanthracene	" 205		
Tetrachloroanthracene	" 220		
Monobromoanthraquinone	" 187		
Tetrabromobenzine	" 160		
Pentabromobenzine	" 240		
Tetrachlorobenzine	" 139	240	
Hexachlorobenzine	" 220	326	
Tribromopseudocumene	" 225		
Trichloromesitylene	" 205		
Mesitylene Sulphonamide	" 142		
Mesityl Bromophide	" 125		
Parabromobenzoic acid	" 251		
Dibromobenzoic "	" 223		
Tri "	" 234		
Chlorodiacylic acid	" 236		

	MP	BP
Dichlorobenzoic acid	201	
Bromoamidobenzoic acid	174	
Pentachlorobenzyl Alcohol	193	
Oxycamphor	137	
Tribromo-chinoline	173	
Chysogen	280	
Ethenyl-diamine	137	

Naphtalene treated with cupric oxide at 400 Centg yields several beautifully crystalizing hydrocarbons. C_9H_6 C_8H_6 C_6H_4

Dibromonaphtalene	76	above Hg
Tetrachloronaphtalene	182	
Monochloronaphtalene Tetrachloride	128	
Dichloronaphtalene "	172	
α-Naphthoic acid	160	
β- " "	180	
Dichloronaphthoquinone	189	
Chloroxynaphtaquinone	200	
Naphthyl = (Naphthalene)	154	Naphthalene Hg

	MP	
Naphthylene-diamine	175	
Dipyridine	108	
Trichloroquinone	164	
Trichlorohydroquinone	134	
Diacetyl Trihydroquinone	153	
Hexachlorobenzine		
Diacetyl-tetrachlorohydroquinone	245	

Resins are formed by the action of phosphoric anhydride on Aldehydes + essential oils

Bromosalicylic Acid	150	
Succinyl-phenol	118	330
Ammonium Sulphocyanate	159	
Thionesoal	180	
Tribromothionesoal	270	
Ortho Toluic Acid	102	
Metabromotoluic acid	205	
Phenylbromoacetic Acid	325	
Dichloroacetamide	96	238
Trichloroacetamide	136	238
Acetoluide	140	
Trichloroacetanilide	82	
Trichlorotoluide	102	

	MP	
Hydroacridine	169	
Benzamide	192	
Dimethylanthracene	200	
Dimethylanthraquinone	158	
Anthracene Orange	225	
Anthrachrysone	320	
Diamidoanthraquinone	236	
Trichlorobenzamide	176	
Dinitrochlorobenzene	103	335
Dibromoazobenzene	205	
Para bromobenzoic acid	251	
Benzylene-phenylamine	—	very high
Dyphenylsulphocarbamide	140	Sulfocarbanilide
Dyphenylcarbamide	205	
Cholesterin	144	
Chrysene	248	
phenoquinone		
Quinone-anilide		
Naphthaquinone	125	
Acetonaphthalamine		
Dinaphthyl	155	
Thio-aniline - Red aniline with S large amount resins	105	
Tetramethylbenzene	80 - Pseudocumene - Mesitylene	200

Acetnaphtalide	159	
Acenaphtene	95	
Acetone-resorcin	212	
Acet-ortho-toluide	149	
Amido-antipyrine	109	
Amido-azo-benzine		
" " Toluene		
Amyl-carbamate	60	220
" Carbolate	95	220
Benzile	90	348
Benzoyl-eugenol	70	
Benzyl-para cresol	70	
Benzyl sulphide	49	
" Carbamide	147	
Monobromacetanilide	164	
Bromolin	200	
Bromamide	117	
Metachloronitrobenzol	44	
Ortho " "	32	
Para " "	83	
Dimethyl hydroquinone	56	
" amido-azobenzine	56	
Dinitrophenol	113	
Dithienyl	83	

	MP	
Dithio-naphtol	180	210
Galanilide	205	
Hydrobenzamide	110	
Hydroquinone-dimethyl Ether	56	
Metanitroparatoluidine	114	
Alphanaphtoquinone	125	
Nitroaniline Meta	109	285
" Ortho	71	
" Para	147	
Nitrophenol Meta	96	
" Ortho	45	
" Para	112	
Nitrosoalphanaphtol	85	
Nitrosodimethylaniline	54	234
Oxam-ethane	115	
Oxanilide	245	
Oxydiphenylamine	82	340
Phenanthrenequinone	202	
Phenetol-carbamide para	173	
Phenocoll	95	
Monochloroparaphenol	87	217
Phorone	28	196
Phtalide	73	290
Phtalyl-diamide	219	

Piracone	42	
Retene	98	394
Stilbene	124	306
Tetra-bromo-phenol-phtalein	220	
Thiophene tetra bromide	112	326
Tolidin	129	
Trichlorophenol	65	243
Tribromoanilin	119	300
Trichloroquinone	165	
Triphenylguanidine	143	
Triphenylmethane	92	359
Benzylene-phenylamine	—	—
Mononitromesitylene	41	
Dinitromesitylene	86	
Dichloromesitylene	59	
Dinitro Xylene	93	
Phna	123	
Cumene mononitro	71	
Acetophenylhydrazin		
Acetophenon (Hypnon)		
Acetophenon monobromat		
" Dibromat		

January 27 1910

Experiments with Melted Sulphur + assay other things —

Alpha Naphtol N.G. —

" Naphthylamine N.G.

Phenanthrene — breaks up Crystals leaves dish — Cut probably immensely modified sulphur good Cut — little of it powerful leaves dish fine —

Resorcinol Cut No signs Crystals Cut like a Heather Decomposed Unfrutable —

Crude Anthracene N.G. —

Monochlorparaphenol N.G.

OVE

Sulphur & Rosin mix if altered
work on cooling with
Considerable Rosin the Gallon
is white, showing S & Rosin
finely divided - of course the
brittle but its very hard
showing possibly of many
Sulphur disseminated definitely (from)
the heavy to harden -
work up —

Latter Nature settles 2.
layers - Bottom layer probably
higher S but it very tough
Cut - Top layer nearly white
& very brittle but harder
not so brittle as Rosin -
The tough parts breaks with
glassy fracture showing no
Crystalizing - its very tough
yet a little brittle Curious
Wood Cut - something in Rosin
Combining with S =
perhaps twice Crystal by measuring

Rosin Telra + Shellac dont go -

Parachloroanline - hard glassy
mixes with Telra hardens it -
not much good ~~& gives~~
with Lac no - dont harden

Sulphoanlanlid with S &
Telra no

Cane Sugar & Shellac
alloys together fine
Hard glass - very little of
any affected by water

Telra & Lac dont alloy
Except with some Rosin w/ lac

good —

Crystalized Tetrachloronaphthalene
or Sulphur gives light yellow alloy
powdery but hard & smooth, just the
same in 24 hours — Thus in 1st quad
alloy struck, its ok for a hard,
precip. comes off clock cutter, polish
reached small precipitation of Tetra —
MP low & liquid — cooled 1st poured
its transparent as glass —
after cooling its very fine crystalline
white S alone which is corrosive.

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good Hard brittle,
Phosphorous Anilide
work up —
Dont mix with Tetraline
mixes with electric
& very hard —

Mixed with Rosin OK
brittle Cut but Very hard
Dissolving in phos anhyd
Very very by heat with
would ok fine surface
think H_2O very effect at
Even with Rosin Impure
phos anhyd is red pure is
white + not affected
by H_2O apparently

April 27 1910

Lac + Spol chems
made by Goldstein

Rheumatic of head - Soft bitter taste
If heated too high decomposes
to red - Lac is too thick
Chl Tolnol - too thick
Ng

Cellulose Glycerol Decomp
about this Tolnol Chl
Makes a Rubber like
Stuff - Ng

Benzoyl-Benzoin - good Solvent
Lac thin, dont crypt out
its tough or is not affected
much by heat, at
ord temp it but little
flex - with small
amount of Lac I put
in it was clearly hard
its very tough Cut -

Anilin Melaphosphate
Melts but decomposes

Diosphenic acid
Decomp - with Lac
too much gas -

Anchoic acid
Azelaic " Mix -
Sebacylic "

Dec - dis Lac off
bubbles - (Thin)

Suberic acid -
Decomp when too high
Dis Lac off bubbles
(Thin) -

Amchusin-Alkasin
This is a fine stuff to blacken
Records in place of
Lamp black - Mells
OK!

Kauri

Dinitrobenzol requires temp of Distiller to be brought up so it sublimes some before it will dissolve — crystl good —
Extremely amusing Kauri makes it yellow amorph & pretty hard —
I stopped going high as the fumes seemed to affect me & I had no Ventilator on — its probably OK
Can't tell until boiler — big bubbles & get the liquid was fairly limpid
Comes away from dish fine —
Hard to get it — Solution dark

Acetamilide Rauni - goes in Sol
Easy dont clog - there is a scum
left on - Lumpid - Crystl Easy but
poor uneven button seems segregate out
wanty its very hard - not tough
If you go high up you have to raise heat
then it darkens + appears decomp
it smokes considerably -
High end sticky + poor -

Dr G Monoethanolamphiline - + Rauni
Dont work well there is an oil
separates out after button pressed
Cant tell anything by using
this impure subs